COUNTERAIR OPERATIONS IN THE DEEP ATTACK: AN ANALYSIS OF FEASIBILITY

A Monograph

by

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ABSTRACT

COUNTERAIR OPERATIONS IN THE DEEP ATTACK;
AN ANALYSIS OF FEASIBILITY

by Maj. Richard L. Mc Cabe, USA, 40 pages.

Recent conflicts have provided valuable glimpses at the lethality of the modern battlefield and the vulnerability of ground troops to air attack. The 1973 Yom Kippur War, the 1982 Lebanese War in the Bekaa Valley and the War in the Falklands demonstrated the importance of the air defense-counter air defense battle to force protection. The presence or absence of air defense assets at the critical time and place was an important, if not decisive factor in the outcome of each of these conflicts.

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INTRODUCTION

FM 100-5 states: "The airspace of a theater is as important a dimension of the ground operations as the terrain itself" reflecting the importance of the AirLand battle's third dimension.[1] From the air, an enemy can direct devastating combat power against a friendly maneuver force. The air defense battlefield operating system (BOS) serves as a protective umbrella, reducing or eliminating the enemy air threat. A well integrated and synchronized air defense umbrella is critical to preserving the commander's freedom to maneuver and to protecting a ground force; particularly during a deep attack.

Combat power is the ability to fight. The dynamics of combat power "decide the outcome of campaigns, major operations, battles, and engagements." It must be "protected" so that it can be applied at the right time and place. This is achieved in part by countering the effectiveness of the enemy's combat aviation with an integrated and synchronized air defense umbrella.[2]

The Soviet concept of deep battle emphasizes "the simultaneous attack and destruction of the entire depth of the enemy's tactical defenses".[3] In WWII the Red Army relied on air protection and at least local air superiority to preserve the combat power necessary to maintain the momentum of their deep operations. The Belgorod-Kharkov operation (August 1943) provided the Soviets an example of the difficulties in coordinating and

synchronizing the air support essential to the survival of a force operating deep in the enemy's rear area.[4]

More recent examples of the importance of counterair operations better apply to the operational and technological context of today and are applicable to a discussion of the deep attack. The 1973 Yom Kippur War, the Lebanese War of June 1982, and the War in the Falklands provide valuable insights concerning contemporary counterair operations. In some cases, these conflicts also illustrate the importance of ground mobility in the counterair effort.

Just prior to the beginning of the Yom Kippur War, recognizing the need to protect their ground forces from the highly respected Israeli Air Force, the Egyptians built one of the most dense missile systems in the world [5]. This complex system included SA-2 and 3 missile systems, each mutually supporting the other with overlapping fires, and more advanced SA-6 systems supplemented with conventional anti-aircraft artillery (AAA). All together, some 150 surface to air missile (SAM) sites and 2500 guns protected the Egyptian crossing of the Suez Canal, their command and control nodes and support bases. The coverage of this system extended several miles over the Israeli front lines.[6] It imposed heavy losses on the Israeli Air Force in the first few days of the war. The high and low altitude SAM systems combined with guns cost the Israeli Air Force over 50 aircraft early in the war.[7]

Initially, Egyptian ground forces were able to conduct operations protected by an air defense umbrella. For perhaps the first time, ground-based counterair systems controlled the air space over the zone of

attack. The Egyptian drive was limited to about 6 miles beyond the Israeli front lines, the limit of the air defense umbrella. According to Lieutenant General Saad El Shazly, chief architect of the Suez crossing, once this umbrella was exceeded the Egyptian ground forces suffered heavy losses:

> "Once in open country outside the protection of... SAMs, the infantry brigade was routed by the enemy air force. Not a single enemy tank or field piece fired a shot. The decisiveness of the attack was a reminder... if [one was needed] of how open...ground forces were to air attack the moment they left the SAM umbrella".[8]

This conflict also provides a good example of the importance of integrating all air defense assets into the counterair operation. Because the Egyptians failed to integrate their air force with SAM defenses they sustained "unacceptable fratricide rates". They lost approximately 60 aircraft (10 percent of their total air force) to friendly fire. As holes developed in the SAM defenses, fear of fratricide prevented fighters from filling gaps as they developed. The depletion of both air force and ground based air defense assets reduced their ability to protect the maneuver force and also reduced ground maneuver flexibility.[9]

The air defense - counter air defense battle of the 1982 Lebanese War in the Bekaa Valley provided additional lessons concerning contemporary counterair operations. Unsupported by an adequate mixture of other air defense systems, the Syrian's Soviet supplied SA-6 SAMS were destroyed in a matter of 3 hours. Additionally, these systems, designed to be mobile, remained in established sites simplifying Israeli targeting. Destruction of the Syrian air defense system permitted the Israeli Air Force to strike decisive blows against Syrian ground forces and critical assets.[10]

On 21 May, 1982, in the Falklands War, the San Carlos engagement saw the sinking of a destroyer, damage to four other ships, the loss of 16 Argentinian aircraft, and a heavy loss of life.[11] The impression that air operations made on both observers and participants in this war is perhaps best illustrated by this statement from a staff officer of 3 Commando Brigade:

> "If the air threat had been properly appreciated, I don't think that this whole venture would ever have been undertaken."[12]

Preserving the air defense umbrella during offensive operations requires integrated, highly mobile, joint and combined arms systems. Synchronizing all of these elements demands careful consideration of related time and space factors. The characteristics of individual systems must be carefully included in that thought process. Since discussing the synchronization of all elements of the air defense BOS is beyond the scope of this monograph, the focus will be on one system in the corps air defense brigade; the corps HAWK battalion.

This paper examines the following question: "Can the HAWK low to medium altitude surface to air missile system in the corps air defense brigade provide effective air defense coverage for a friendly deep attack? A simple time/distance model will be introduced to answer this question. The model will also permit an examination of the effect of the employment of HAWK on the air defense BOS in general, and specifically, the mobility of the friendly force conducting the attack. The model is proposed as an analytical tool to assist in future air defense planning for offensive operations with HAWK. The guidance offered in FM 44-90,

HAWK Battalion Operations ("Offensive Operations"), serves as a start point for analysis.

The counterair mission is not performed by the Air Force or Army alone and within the Army, not exclusively handled by Air Defense Artillery.[13] Army and Air Force contributions to counterair operations are inextricably intertwined because of the participation of joint and combined arms assets. Therefore, the Army and Air Force are the two major parts of what must remain an indivisible whole; the integrated air defense system (IADS). The risk of deep operations to one element of this system is a risk to each of its components just as a chain is only as strong as its weakest link. A discussion of counterair operations in support of a friendly deep attack must consider, at least in overview, each link of this chain.

As implied earlier, the employment of HAWK to provide air defense coverage for a maneuver force in deep operations is based on the presence of a HAWK battalion with three firing batteries of two fire units each (six independent fire units) in the Corps air defense brigade. It also assumes that the Patriot system will not be organic to the corps air defense brigade in the future but will continue to be an echelon above corps (EAC) asset. An additional assumption is that as an EAC asset Patriot will generally continue to be employed to protect air bases and high value assets mostly in corps and army group rear areas where its well suited to the threat.

Writings from the Eastern block and the Soviet Union characterize the threat as a.... "number of mutually linked, consecutive massed

strikes"[14] with.... "attacks by missile troops involving the use of cluster charges with conventional weapons upon air bases, anti-aircraft defense and enemy command and control systems".[15] They clearly envision the use of aircraft, missile (including TBMs) and artillery assets in a "coordinated and intense effort".[16] Patriot's better ability (versus HAWK) to handle the high firepower requirements of this threat, together with its limited mobility and availability is assumed to preclude its employment with maneuver units.

Since enemy air attacks can neutralize not only the advanced elements of a friendly maneuver force but the whole of its depth simultaneously,[17] it is important that counterair operations are synchronized with the scheme of maneuver to cover the entire friendly force during a deep attack. Understanding the impact of time and space factors on specific systems contributing to the counterair effort makes synchronization possible.

COUNTERAIR OPERATIONS (AN OVERVIEW)

Counterair operations in the AirLand Battle depend on mobile, mixed and integrated ground based air defense systems together with combined arms initiatives and responsive Air Force counterair assets. This "system" must be synchronized with the scheme of maneuver. At the same time, the air threat must be disrupted through neutralizing or degrading the enemy Close Air Support system.[18] Maintaining a synergistic relationship between each of these components enhances the protection of the force. This is particularly important in the AirLand Battle's deep attack. An overview of counterair operations in general will clarify the sensitive relationship between the players in the counterair effort and set the stage for discussing the employment of HAWK in the deep attack.

CLASSES OF COUNTERAIR OPERATIONS

Counterair operations are generally divided into three classes; offensive counterair (OCA), defensive counterair (DCA), and suppression of enemy air defense (SEAD).[19]

OCA operations destroy enemy air forces at a time and place of our choosing. They are essential to gaining air superiority and establishing conditions favorable for the conduct of friendly operations.[20]

DCA operations destroy attacking enemy aircraft or missiles, or reduce or nullify the effectiveness of their attack. There is a synergistic relationship between Air Force and Army counterair systems. The assets allocated for DCA vary according to both the threat and the quality of the counterair effort of the ground forces. Likewise, the

amount of air assets allocated to other missions (OCA, AI and CAS) is based on the DCA requirement.[21] Aircraft are apportioned to each of these operations based on this relationship. The air campaign is phased, and air assets are apportioned according to the following general sequence:[22]

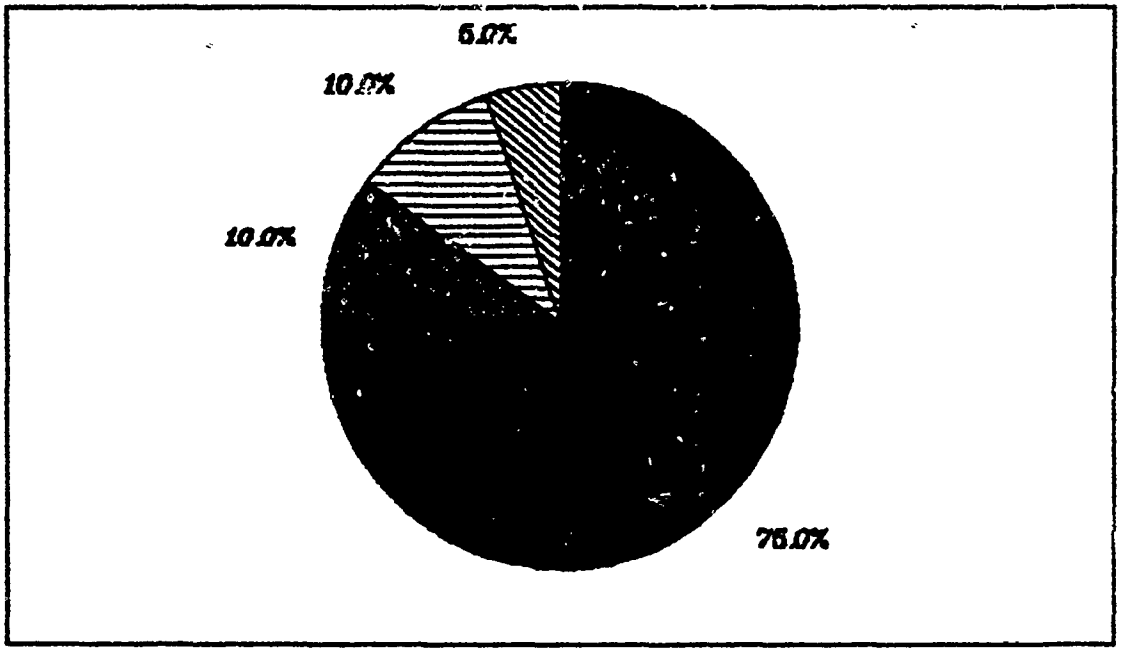
a. Deny the enemy local air superiority
b. Achieve local air superiority
c. Gain area air superiority
d. Gain air supremacy.

As the air campaign progresses through its phases, and the DCA effort has met with success, multi-role aircraft become available for the other three missions (CAS, AI, OCA). It follows that the heavier the reliance on Air Force DCA assets, the fewer CAS, AI, and OCA missions will be flown. FM 44-100 states:

> "When ...(the Joint Force Commander) determines that the quality, quantity, and contribution of Army air defense is sufficient, the JFC can reduce the apportionment of Air Force DCA assets."[23]

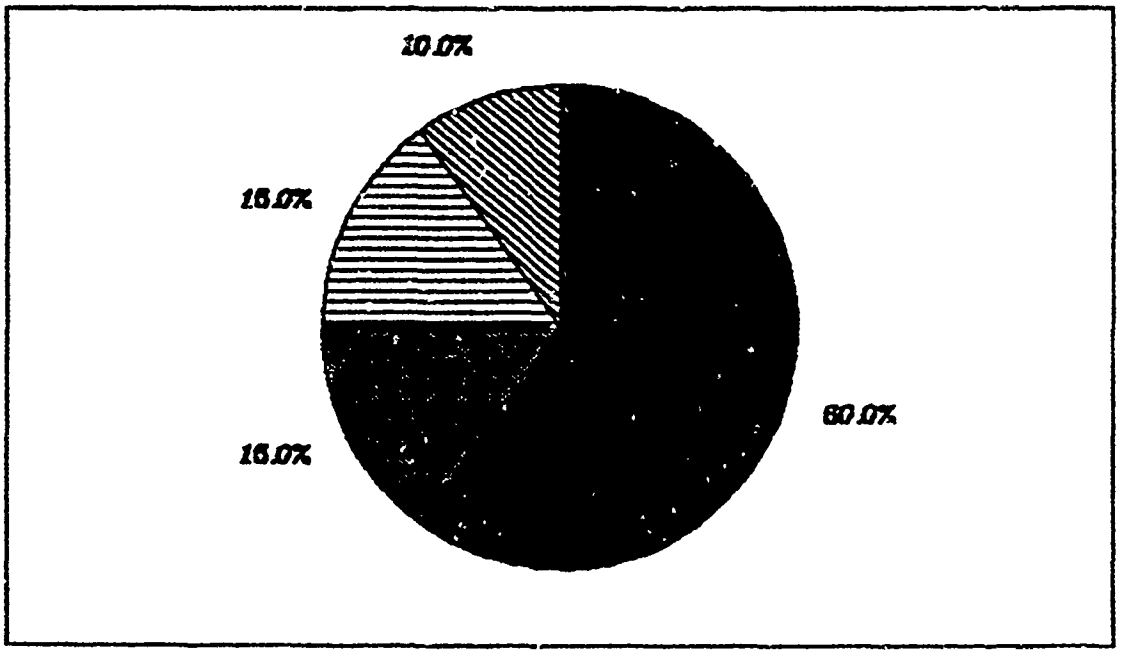
Figures 1-4 provide a notional illustration of the variation in apportionment in each phase of the air campaign. Since the actual apportionment would be based on the theater threat at the time of the air campaign, the values shown (percentages) are for illustrative purposes only.

FIGURE 1. Initial Phase
[Deny enemy local air superiority]



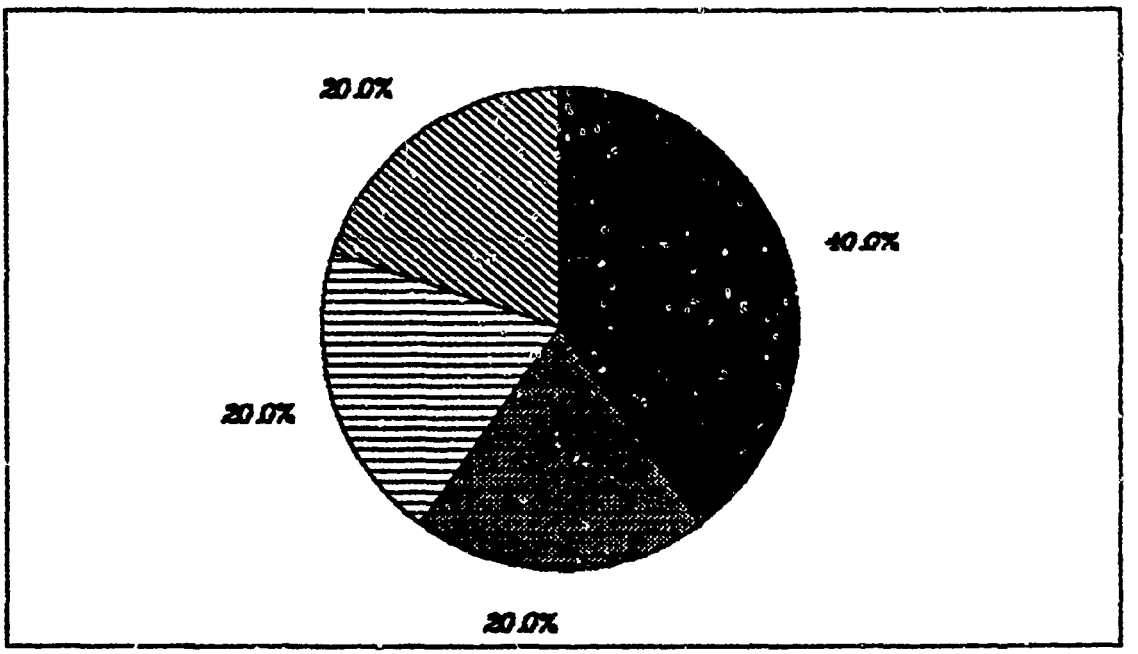
DCA=75% OCA=10% CAS=10% AI=5%

FIGURE 2. Second Phase
[Achieve local air superiority]



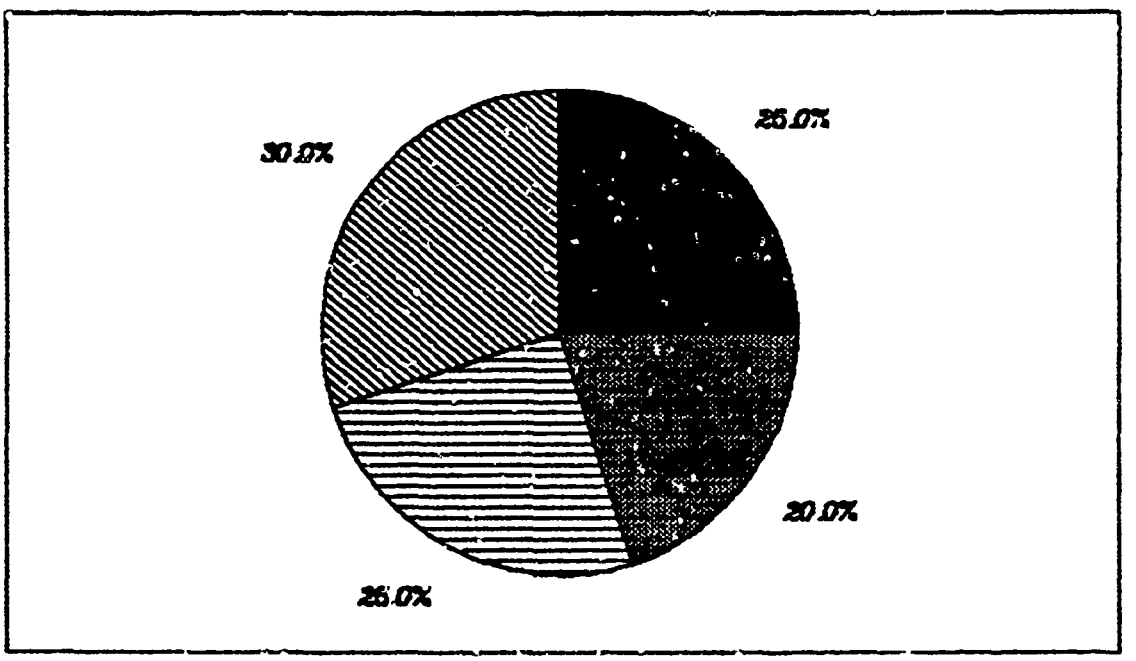
DCA=60% OCA=15% CAS=15% AI=10%

FIGURE 3. Third Phase
[Gain area air superiority]



DCA=40% OCA=20% CAS=20% AI=20%

FIGURE 4. Fourth Phase
[Gain air supremacy]



DCA=25% OCA=20% CAS=25% AI=30%

This relationship suggests the importance of dedicated and synchronized Army air defense systems and Air Force assets both fulfilling their complementary roles in the counterair mission.

ENEMY AIR DEFENSE THREAT

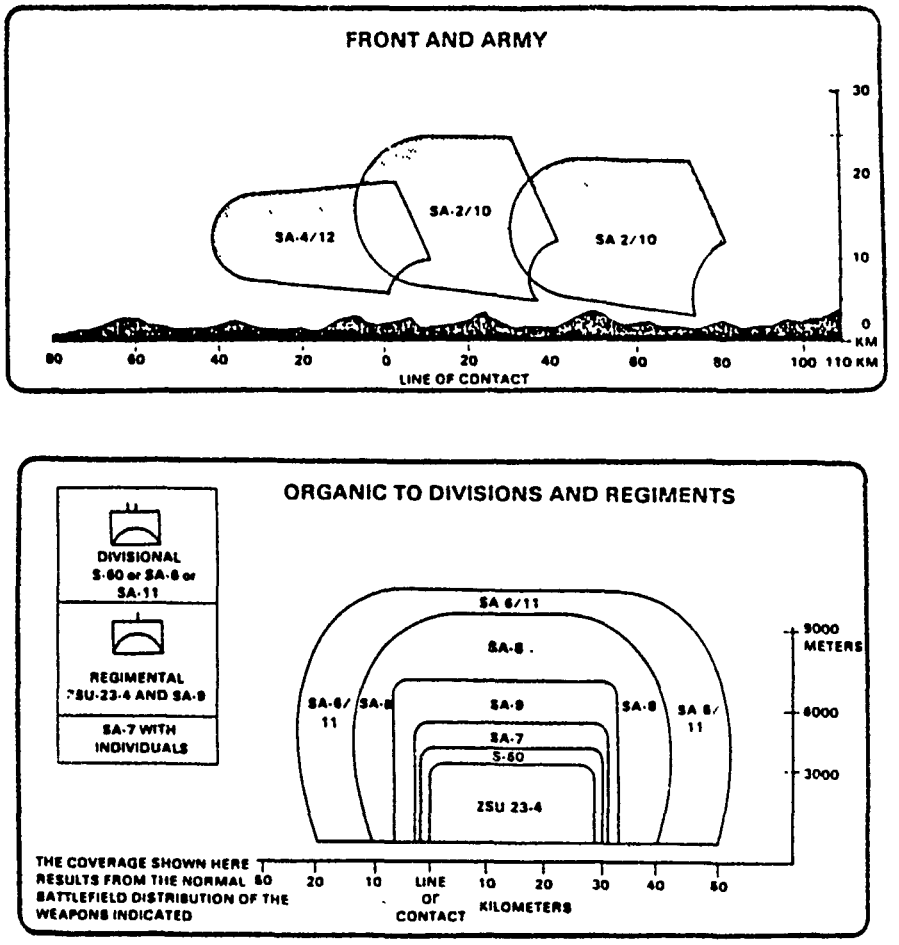
The intensity of enemy counterair operations in the deep battle area has the potential to disrupt the balance between the employment of Air Force and Army counterair assets. Just as greater quality and quantity of Army ADA may reduce the Air Force counterair asset requirement, the risk to friendly aircraft supporting the deep attack increases the importance of the Army counterair effort.

The Soviets employ a mass and a great mix of air defense systems throughout the depths of their area of operations. Recent Soviet writings clearly express an appreciation for the air threat and reflect particular interest in lessons learned from recent "local wars". They have shown particular interest in the 1973 Yom Kippur War and the 1982 Lebanese War in the Bekaa Valley.

The critical nature of air defense "throughout the altitude range" is of great concern to the Soviets.[24] How this concern manifests itself in terms of weapons densities is shown graphically in Figure 5.[25] This graphic is a simple but important illustration of the complex and redundant threat to friendly aircraft operating in the deep battle area. The projection of SA-4 and SA-12 coverage over 40 kilometers beyond the line of contact restricts the positioning of combat air patrols in that area. The mass of systems, their redundancy and common use of some

emitters for multiple purposes is intended to complicate SEAD operations and make the Soviet integrated air defense system survivable.[26]

FIGURE 5



In addition to the systems represented in these graphics, the Soviets are fielding entirely new and improved gun and missile weapons. The list includes: [27]

A. A new SA-10 missile system with a much greater envelope and firepower than the SA-2&3 systems.

B. Below army level, a new SA-13 missile system.

C. In addition to the old SA-7 and ZSU-23/4 systems, the SA-14, the SA-16 shoulder fired man-portable systems and a new state of the art 30mm self propelled anti-aircraft gun system, the M1986, are all being fielded.

Although the specific coverage of these newer systems does not appear in the graphics, their addition to the coverage envelopes that are shown intensifies an already powerful threat to friendly air operations in the deep battle area. This point serves to emphasize not only the importance of integrated Army counterair operations but also the advantages of degrading and disrupting the enemy commander's ability to bring his close air support assets to bear on friendly forces.

Given the massed attack techniques used by Soviet aviation, planning for any attack must include measures in the intelligence preparation of the battlefield (IPB) process to inhibit enemy use of CAS.[28] Left unchecked, air power is one of the most rapidly reacting means the enemy is likely to use in response to an attack into his tactical or operational depths. At his disposal the enemy front commander has a division each (up to 144 aircraft per division) of fighter, fighter-bomber, and fighter interceptor aircraft.[29] From these assets, he will assemble large attack packages which he can be expected to direct against an attacking friendly force as it nears and penetrates the forward line of own troops (FLOT) and as it approaches the objective. The Corp commander will direct his organic targeting means to attack accessible elements of the enemy CAS system in order to decrease its potential to interfere.[30]

THE ENEMY CAS SYSTEM

The enemy CAS system consists of about 6 components each made up of several sub-elements. FIGURE 6 lists the major components of the CAS system and shows the sub-elements normally associated with the Vector and Target Designation Point (VTDP). The detecting sensors that can provide targeting information on those sub-elements are also shown.[31]

FIGURE 6. ENEMY CLOSE AIR SUPPORT COMPONENTS

1. Aircraft/Airfields - HINDS, HIPS, HOUNDS, SU-25, etc...
2. VECTOR AND TARGET DESIGNATION POINTS (VTDP)
3. RADIO NAVIGATION POINTS (RNP)
4. FORWARD AREA REFUEL, REARM POINTS (FARRP)
5. FORWARD AIR CONTROLLERS (FAC)
6. GROUND CONTROL INTERCEPT (GCI)

VTDP Elements	Detecting Sensors*
BTR-60s (2 or 3/army	Various imagery
R8XX Radio	Guardrail, Senior Spear
R1XX Radio (HF)	RECS (OUTS)
R4XX MC Radio	Quicklook, Senior Ruby
Thin Skin Radar	PLSS, RPDS
Long Track Radar	

*These are listings only; sensors do not necessarily match the elements on the left.

Enemy aircraft are positively controlled from takeoff at their departure airfield using Vectoring and Target Designation Points, and Radio Navigation Points (RNP). They are then released to the Forward Air Controller (FAC) who directs the delivery of their ordnance. Helicopters are also under positive control of the VTDPs and are brought forward to staging areas and Forward Area Rearm, Refuel Points (FARRPs) for fast sortie turn around. FACs exercise terminal control from positions normally located with the lead maneuver forces. GCI sites, normally used to control air defense and enemy OCA operations can assume the VTDP function when required.[32]

As part of the IPB process, the G2, Fire Support Coordinator (FSCOORD) and the Air Defense Coordinator (ADCOORD) carefully analyze the all source battlefield situation to target the components of the enemy CAS system. The loss of the VTDP, RMP and the FAC have the highest potential for degrading the enemy's ability to employ CAS against a friendly unit conducting a deep attack or a counter attack. Loss of the VTDP and the FAC "...should preclude the effective use of CAS until these means are reestablished".[33]

Because of their distinctive signatures the VTDP and the FAC are more vulnerable targets. If resources and time are available, attacking the RMPs will further degrade and confuse the enemy's employment of CAS. Attacking the appropriate FAC elements "...will be accomplished concurrently with the attack on the enemy's force command and control nodes".[34]

Indications are that there are 2 to 3 VTDPs in an army area.[35] An unclassified laydown of the enemy CAS system is provided at Appendix A. The specific operational characteristics of each of the components in this system are known. Each of these can be matched to a specific friendly sensor system(s)[36]. The Soviets employ many of their electronics systems (particularly the Long Track and Thin Skin radars) for many purposes, so the detection of one element of this system does not constitute the presence of a VTDP. Aware of the signature of this essential element of their CAS system, the Soviets be expected to employ passive countermeasures for its protection so that not all of the unique observables are detected simultaneously. Human judgement will be

essential in interpreting available data and identifying the presence or absence of the components of the enemy CAS system.[37]

The degradation of the means of positive control of close air support aircraft seriously limits the range of options available to the opposing commander as a means of responding to an attack deep into his tactical or operational formations. The importance of degrading the enemy CAS system is considered one of the high priorities of the corps collection and deep strike elements. The VTDP is one of the principle targets for the new Army Tactical Missile System (Army TACMS).[38] The Air Force will also participate in the destruction of the enemy CAS system with air to ground fires.[39]

A concerted effort devoted to degrading and interfering with the enemy's means of directing an air attack against friendly forces is a second "link in the chain" of counterair operations.

ARMY COUNTERAIR OPERATIONS

The third and final link in the chain is composed of integrated Army counterair operations based on a combined arms effort aimed at protecting forward forces and preserving the freedom to maneuver. Field artillery elements will target critical enemy air assets, RARPs within range, and will be important in the SEAD effort. Army aviation (helicopters) will provide self defense and air defense on call and also participate in SEAD operations. Other combined arms elements and special operations forces will participate in the overall effort through self defense, destruction of critical enemy air assets and SEAD.[40]

This discussion will not include a description of the collection and coordination effort required to integrate this effort on the part of the entire combined arms team. It is important, however, to take note of this cooperative effort with particular emphasis on specific elements that play a key role.

During the deep attack, friendly helicopters will likely be employed in screen missions on the flanks and to the front or rear or both of the formation. Once armed with Air to Air Stinger (ATAS), the helicopter will have a variety of weapons to employ in counterair operations as a secondary mission.[41] The flexibility of the helicopter will allow it to cover large areas in the air to air role and react to and concentrate against enemy helicopter attacks quickly. These attributes will enable the ADCOORD to coordinate the use of helicopters to fill gaps in the air defense umbrella caused by terrain masking or the range limitations of dedicated air defense systems.

The Forward Area Air Defense System (FAADS), to be fielded in the near future, is based on a concept of mobility, netted sensors and distributed fires which will make it possible for a mix of systems to share a common air picture and to engage fixed wing or helicopter threats efficiently. Since divisional short range air defense (SHORAD) units are often habitually aligned to supported brigades and task forces, the actual coverage provided by FAADS will likely appear in clumps across the deep battle area. Systems capable of greater range, altitude, and area coverage must reinforce the fires provided by FAADS.

The absence of Systems such as HAWK and Patriot in air defense coverage provide attacking enemy aircraft a "preferred attack option". By overflying the FAADS envelope, attacking aircraft take advantage of a "SHORAD hop" providing the enemy an open window of vulnerability against friendly maneuver forces. The FAADS system was designed to operate in conjunction with other systems in the higher altitude ranges to eliminate the preferred attack option.

FM 44-100 states that the corps commander must provide reinforcing air defense fires for a unit conducting offensive operations.[42] The Corps Air Defense Brigade is equipped with one HAWK Battalion with six (6) Assault firing platoons. The Assault Firing Platoons (AFPs) are equipped to operate independently and are 100% mobile in one serial. Recent successful exercises at the National Training Center using innovative employment techniques suggest that HAWK is sufficiently survivable to support offensive operations.[43]

MOBILITY ANALYSIS

The use of HAWK to reinforce the short range air defense fires of a force conducting a deep attack requires careful planning. As with all maneuver, time and space factors are the mortar which holds the operation together. FM 44-90 (HAWK Battalion Operations) provides guidance for planning the employment of a HAWK Battalion in offensive operations. A simple time and distance model can be used to test this guidance and perhaps offer an alternative approach that will enable the maneuver force commander to predict when he will be in danger of exceeding his air defense umbrella.

ASSUMPTIONS

The mobility model is based on the following assumptions:

A. Available routes are suitable for movement of wheeled vehicles and towed loads.

B. Radar coverage allows engagement of targets at the maximum range of the HAWK system (40 KM). Although at lower altitudes, this assumption may not be realistic, it simplifies the illustration. In practice, the actual engagement ranges imposed by terrain masking can be used in the model for planning operations.

C. Since operations across the FEBA will preclude the conduct of reconnaissance, the firing position to be occupied by the AFP will be unprepared. An average of at least one hour will be required for emplacement, particularly at night.

D. In order for all six of the AFPs of the Corps HAWK Battalion to participate in the deep attack, coverage must be provided by other systems positioned close to the FEBA before the passage of lines occurs. This model assumes this coverage extends 35 kilometers beyond the FEBA. If reinforcement is not available, at least one echelon of AFPs (two fire units) from the Corps HAWK Battalion will perform the mission.

E. Mutual support is maintained in the model according to the guidance in FM 44-90. The required distances are 20 KM separation or less between AFPs. Assault firing platoons are arranged in three echelons of two fire units each.[44]

A heavy division moving over four routes occupies about 150 KM of road space.[45] If the coverage of the six firing platoons is simply plotted on graph paper (according to assumption E), it appears that the battalion can cover an area 95 KM beyond the FEBA with a frontage of 100 KM provided all six fire units are operational. It appears that at the very maximum, the corps commander has the means to cover (with HAWK) a division in the deep battle area to a depth of 95 KM. While this appears to be a shortfall, it does not convey a clear picture of the dynamics of extending the coverage to that depth.

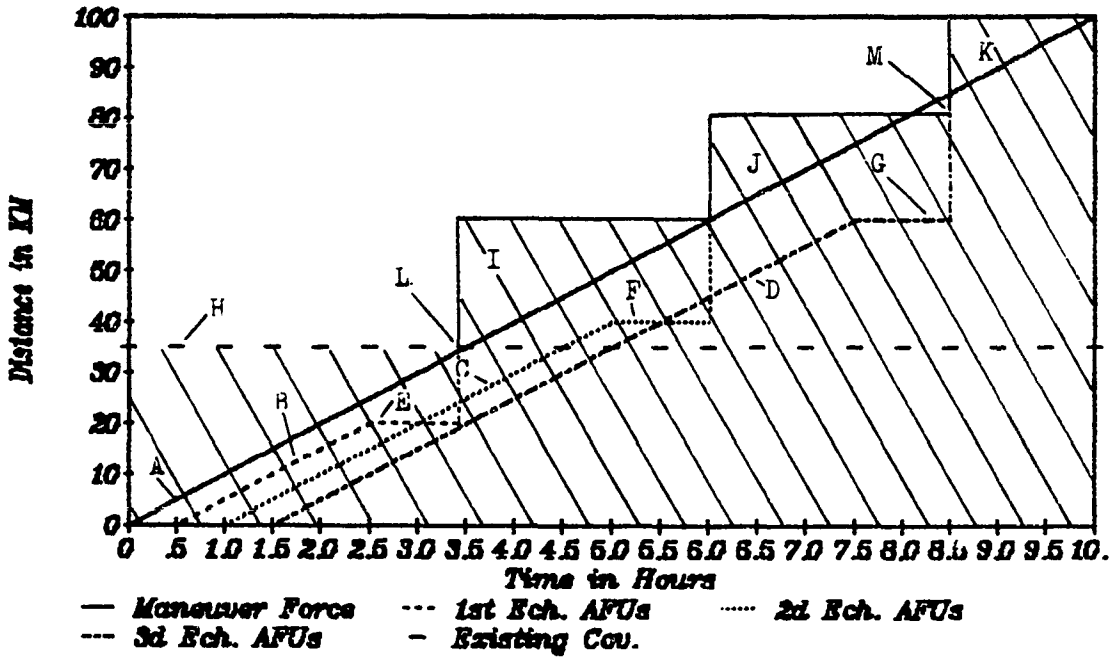
According to the procedures in FM 44-90, the AFPs arrive at their firing positions by "leapfrogging" the trailing AFP echelon forward. There seems to be no consideration of the realities of limited numbers of secure march routes. It also implies that the leapfrogging or bounding technique is possible on congested routes and possibly over rough terrain. By the guidance in FM 44-90, the trailing echelon of AFPs would have to travel up to 20 KM beyond the two leading AFP echelons (as much as 60 KM), emplace, and assume the mission before the lead maneuver companies exceed the HAWK umbrella. As Figure 7 will show, the lead maneuver companies can exceed coverage in as little as 2.5 hours at a rate of march of 10 KM in the hour. The mathematics do not support the guidance of the FM.

ABOUT THE MODEL

Figure 7 shows the relationships of time and distance as they affect six HAWK assault firing platoons (three echelons of two firing platoons each) supporting a maneuver force in a deep attack.

The horizontal axis is calibrated according to the number of hours after H hour. H hour is the time at which the maneuver force crosses the line of departure (LD). The vertical axis represents distance travelled in kilometers beyond the LD. Each chart used in the following discussions will have a legend at the bottom for reference.

FIGURE 7
(Rate of March; 10 KM-in-the-Hour)



The diagonal solid line A (solid) which runs from the lower left to the upper right corner of the graph is the maneuver force progression line. It is a function of the rate of march in kilometers-in-the-hour multiplied by the time since H hour. Figure 7 is based on a rate of 10 kilometers in the hour. This is a typical rate of march for large units

in darkness.[46] Line B (small dash) is the progression line of the first echelon of HAWK AFPs. Line C (dotted) shows the progression of the second echelon HAWK AFPs and line D (large/small dash) shows the progression of the third echelon AFPs.

The reader will notice that (going from left to right) each echelon is staggered by about one half hour. This means simply that the first echelon AFPs fall into the march column and cross the LD 30 minutes after the lead elements of the maneuver force. Similarly, the second echelon AFPs moving within the march column cross the LD 1 hour after the lead companies. Finally, the third echelon AFPs cross 90 minutes after the lead companies.

At the top of each AFP progression line there is a horizontal segment one hour in duration (E, F, G). This is the required emplacement time for each AFP. The fire units cannot assume their mission until they have been emplaced. The horizontal orientation of the line indicates a progression in time with no progression in distance travelled.

Once each AFP is operational and has assumed its mission, the respective coverage provided is indicated by the shaded areas I, J, and K. The point in time which marks the beginning of an AFPs coverage umbrella coincides with the end of the emplacement time. By following any AFP's progression line through to the end of the emplacement period and moving a distance on the vertical axis of 40 kilometers (HAWK engagement range) from that point, the maximum coverage extending over the maneuver force becomes apparent. Since the AFP remains stationary during operations its coverage range remains the same over time. Following the maneuver force progression line diagonally to the upper

right, there is a gradual decrement to the umbrella over time covering the ground force in the attack until successive AFPs assume their mission.

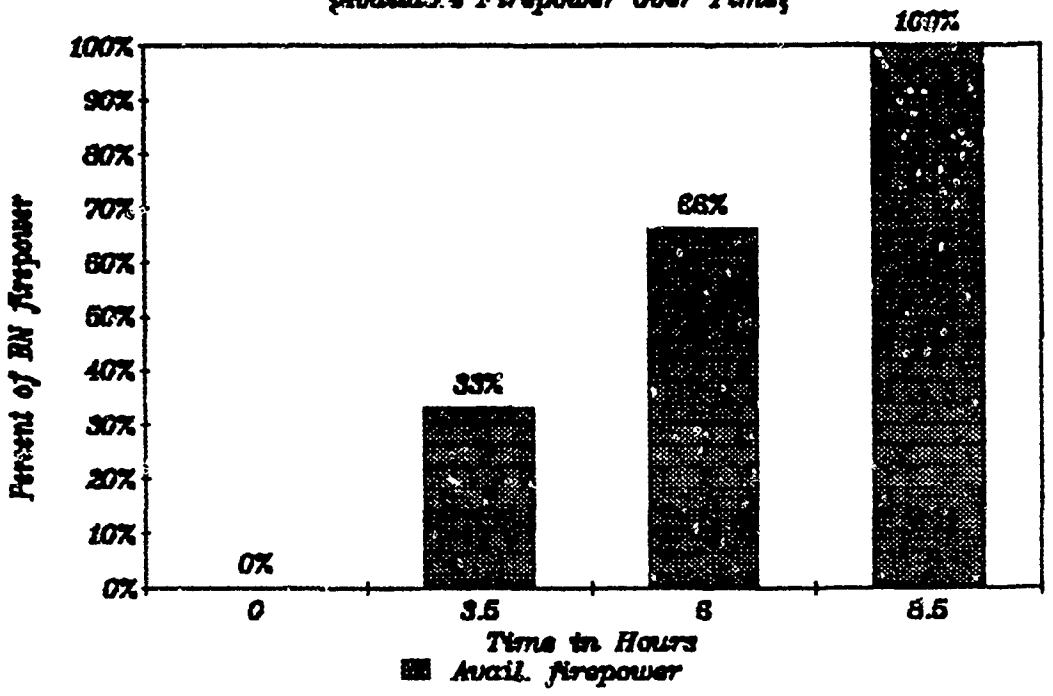
The dotted line running horizontally across the chart at a range of 35 kilometers (H) is the limit of the coverage provided by fire units positioned about 5 kilometers behind the LD.

In reading the chart, as long as the maneuver force progression line remains within the shaded areas it is within the air defense umbrella. The distance within the umbrella is determined by measuring the distance in kilometers from the maneuver force line to the outer edge (going vertically) of the shaded area. Point L indicates that at exactly the time when the maneuver force leaves the existing coverage of fire units along the LD, the first echelon AFP assumes its mission and extends the coverage an additional 25 kilometers out to 60 kilometers. This assumes no friction and that everything goes perfectly. Even under ideal conditions such as these, the chart shows that the third echelon AFP cannot assume its mission in time and the lead maneuver elements lose their HAWK air defense coverage (M).

At the rate of march of 10 kilometers in the hour used in Figure 7 the HAWK echelons must cross the LD no later than the time shown on the horizontal axis. If the attack will exceed a depth of about 80 KM, the third echelon AFPs must cross the LD at least 30 minutes earlier to allow the coverage umbrella to be activated in time and for the coverage to extend forward of the lead maneuver elements and over the enemy's front lines.

Figure 8 shows the relative percentage of the HAWK battalion's available firepower according to the dynamics of Figure 7. None of the corps HAWK battalion's firepower can be brought to bear until the 1st echelon AFPs have emplaced and assumed their mission. The total HAWK firepower is not available until all AFPs are emplaced and the maneuver force is well into the deep battle area. This is a significant concern if the enemy chooses to strike early with considerable mass to discourage further penetration. In each of the situations we will consider, the firepower availability function is the same.

FIGURE 8
{Available Firepower Over Time}



The coverage that is available as a function of the dynamics of time and distance is what is really important to the commander conducting a deep attack. If this is not considered in the planning process it is possible for the supported force to exceed its air defense umbrella while successive HAWK echelons emplace.

The maneuver force commander must plan the organization of his march columns considering the fact that the HAWK assault firing platoons which will protect his force must begin crossing the LD no later than 30 minutes after his lead elements. Based on the 10 KM rate used in Figure 7, this means that the first echelon AFPs must be no more than 5 KM back in the march column.

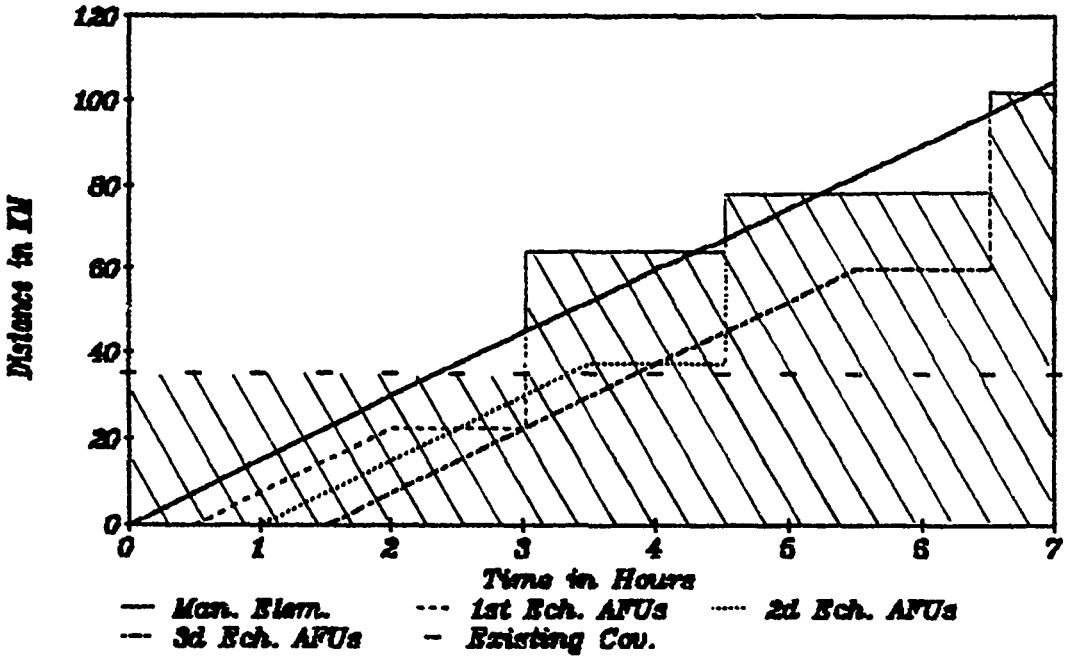
TABLE 1 shows the approximate number of vehicles (including trailers) that will be included in each type of AFP and the amount of road space that each will occupy. The actual numbers of vehicles in each AFP will vary slightly with the situation.

TABLE 1 [47]

AFP Type	#Veh.	Road Space (25M Interv)	Road Space (100M Interv)
Battery (-)	28-31	1.1-1.3KM	3.2-3.5KM
AFP (Light)	14-17	.5-.65KM	1.5-1.8KM

Figure 9 shows the impact of increasing the rate of march from 10 to 15 kilometers in the hour. Using the same staggered sequencing for the AFP echelons the maneuver force exceeds its air defense coverage at 35, 60, and 80 KM beyond the LD. In each case the distance by which the force exceeds it umbrella increases before successive AFPs assume their mission: 5, 10 and 17 kilometers respectively.

FIGURE 9
(Rate of March; 15 KM-in-the-Hour)



To prevent this, the AFPs must either cross the LD earlier or they must emplace earlier. Assuming that the best alternative is to emplace earlier from the march column, the AFPs must do so at the following distances beyond the LD for the coverage to remain intact :

1st Echelon AFPs.....10 KM (.6 hrs)
2d Echelon AFPs.....17 KM (1.2 hrs)
3d Echelon AFPs.....21 KM (1.4 hrs)

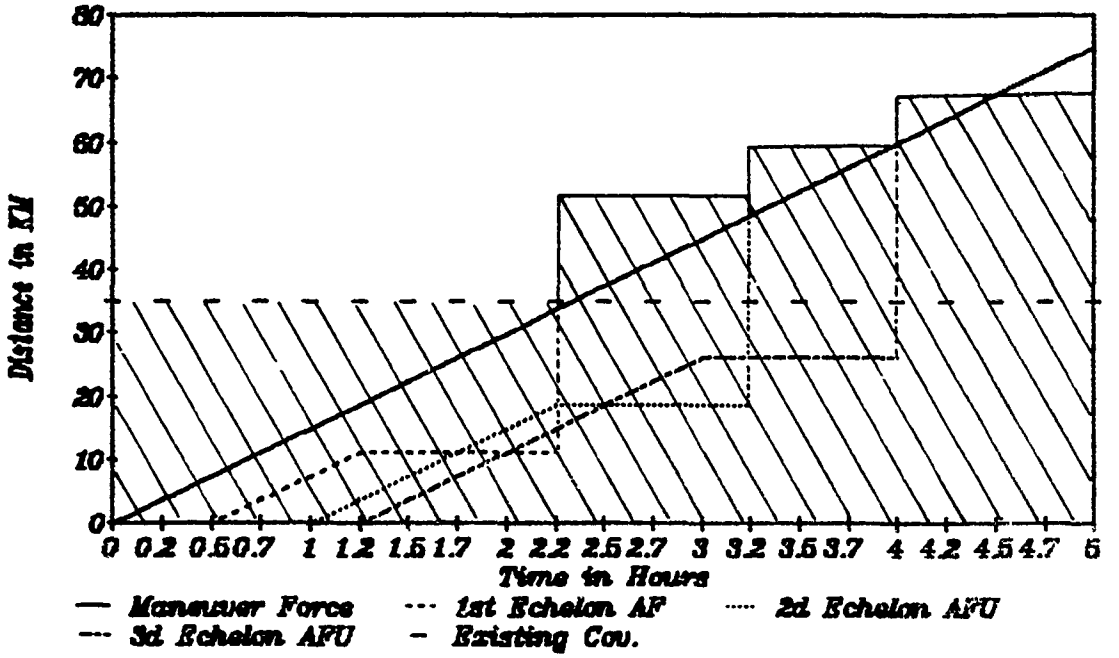
This distribution of fire units reduces the total depth of HAWK coverage to about 60 KM. Since the coverage should extend well beyond the lead elements of the maneuver force, the depth of the friendly deep attack will be reduced to as little as 40 KM depending on the threat and desired reaction time. Table 2 provides an indication of the coverage requirement forward of the maneuver force lead elements based on the ordnance release distance of enemy aircraft:

TABLE 2. ORDNANCE RELEASE DISTANCES[4:8]

Attack Technique	Ordnance	Release distance
Gravity bombing	Bombs	3 KM
Tossbombing	Bombs	3.2 KM
Standoff	ASM	10-70 KM
Popup	Bombs	1.1 KM
Laydown	CBU/NAPALM	9-1.2 KM

Factors such as echelon sequencing, rates of march for the entire column and emplacement locations (in terms of distance forward of the LD) can be varied to optimize the total depth covered. Figure 10 shows the results of shifting the interval between echelons so that the first two echelons depart at 30 minute intervals and the third echelon departs 15 minutes behind the second.

FIGURE 10
(Rate of March; 15 KM-in-the-Hour)

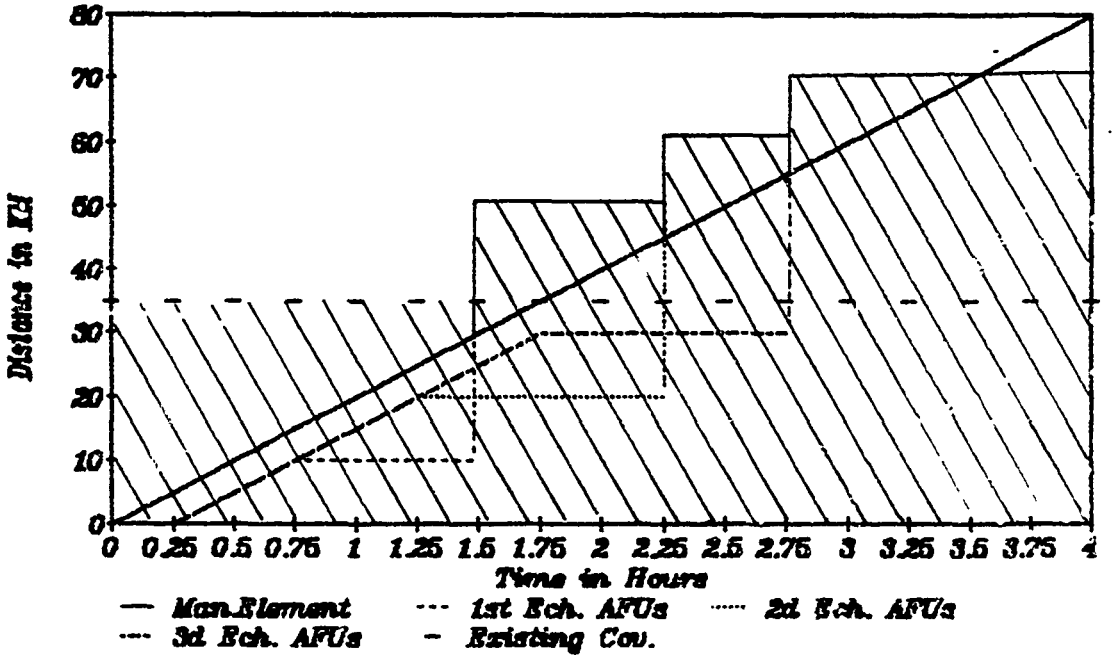


In Figure 10, the 1st echelon AFPs emplace at about 10 KM beyond the LD, the 2d echelon emplaces at about 20 KM and the 3d echelon emplaces at about 25 KM beyond the LD. The coverage appears to remain

intact to a range of just over 65 KM, but the risk is still high at times just prior to each AFP echelon assuming its mission. At 2.2 hours, 3.2 hours and at 4 hours there is little to no standoff protection.

Figure 11 shows the impact of a 20 KM march rate on the employment of the AFPs. While the depth of coverage may be indicated at over 65 KM, this is only possible when all AFPs (occupying about 6 KM of road space) cross the LD simultaneously, 15 minutes or less behind the lead maneuver companies.

FIGURE 11
(Rate of March; 20 KM-in-the-Hour)



To insure that extended coverage is available before the maneuver force exceeds the existing coverage, the 1st echelon AFP must somehow reduce its emplacement time (which may not be possible). The risk of being so far forward to the AFPs is high. The risk associated with the displacement of combat units which would otherwise occupy the AFPs' 6 KM road space may not be acceptable to the maneuver force commander.

Movement of HAWK AFPs by helicopter has not been addressed here but it is an alternative. One AFP Requires 15 lifts (CH-47) for essential equipment and personnel.[49] This translates to 90 CH-47 lifts of essential equipment for the entire HAWK battalion. Additional equipment must be moved by ground. The AFPs may require resupply by air if prime movers are unable to reach the unit position. If this option is selected, air support from the Corps Aviation Brigade (with 64 CH-47s) would be necessary.[50]

It remains to be seen whether the heavy transportation demands of offensive operations (especially for ammunition, fuel and spare parts) will permit significant air movement and resupply of HAWK AFPs. As with all matters of resource allocation, it is a question of priorities.

CONCLUSION

Successful DCA operations early in the conflict will set the conditions which allow multi-role aircraft to be diverted from DCA to OCA, AI and CAS operations. This will add to the combat power available to the maneuver force commander. These measures will help friendly forces begin to seize the initiative and establish conditions favorable for offensive operations.

Retaining the initiative and freedom to maneuver will be the result of a successful air campaign that began long before the concept of the operation for the deep attack was formulated. The complementary efforts of joint Army and Air Force counterair operations form three links to the counterair "chain" which must retain relatively equal strength to gain success. As we have seen, the enemy's air defense capability in the deep battle area makes maintaining synergy between each link in this chain very challenging. The ever increasing threat to friendly aircraft operating in the deep battle area makes the contribution of Army counterair operations more essential. It also emphasizes the importance of degrading and disrupting the enemy's ability to employ and positively control his air power.

Degrading the enemy's ability to employ his air power against a friendly force is a necessary part of establishing the conditions for and protecting the force during the deep attack. It is a continuous combined arms operation, as important as the destruction of enemy aircraft, and constitutes a significant contribution to the overall counterair effort.

The classroom of contemporary warfare has taught us that unless all contributors to counterair operations are well integrated and synchronized, gaps in the air defense umbrella will develope. These gaps can be discovered and exploited to the advantage of one or the other antagonist. The Soviets take measures to avoid vulnerabilities using a mass and mix of mobile ground based air defense systems to cover the entire altitude range. The U.S. Army's fielding of FAADS (Forward Area Air Defense System) together with the employment of helicopters with Air to Air Stinger will provide low altitude coverage. Medium to high altitude coverage must be provided by the corps organic HAWK battalion.

The time/distance model proposed in this monograph provides important observations concerning the ability of the corps HAWK battalion to support highly mobile and fluid operations: The guidance offered in FM 44-90 is insufficient for effective planning for air defense operations in the deep attack; during the deep attack, the weakest link in the counterair chain may be the corps commander's ability to provide an integrated air defense umbrella for his maneuver forces that includes medium to high altitude coverage.

HAWK is a site configured system of multiple components each of which must be individually emplaced and oriented. At even a low pace of operations, the time required for this task in a location which has not been reconnoitered and prepared is considerable . Emplacement time becomes an even more debilitating factor as the rate of march of the attacking element increases. Without placing the HAWK AFPs well forward in the maneuver force march column and assuming greater risk, the maneuver force commander can expect to lose the protection of his medium

to high altitude air defense umbrella at various times during the deep attack.

The risk of placing the AFPs well forward is two-fold; the increased probability of the destruction of the soft HAWK units by enemy fires and the displacement of the direct fire assets normally occupying the 6 KM of road space (approximately) used by the AFPs. The need for medium to high altitude air defense protection virtually dictates that the ground force commander assume this risk.

As we have seen, the firepower of the corps HAWK battalion gradually becomes available as each echelon of AFPs become operational. In the first several hours of the operation, when the friendly force conducting the attack is perhaps most vulnerable, the only medium to high altitude coverage available will be that provided by units behind the FEBA. Engagements by these units will occur at ranges where the system's kill probability is declining.[51] The total firepower of the corps HAWK battalion is not available until the friendly force is well into the deep battle area.

Perhaps these risks are acceptable given the nature of the mission (the deep attack is inherently high risk). However, it must be remembered that the dynamics portrayed by the model in this paper do not include elements of fog and friction, factors which may dominate the deep battle area. Because of the influence of these factors on the employment of a complex weapons system like HAWK, the flexibility of a commander operating in the deep battle area will likely be constrained to distances and speeds far less than the charts in this paper have shown. Therefore,

in terms of time and space only, and at the depths considered in this monograph, the employment of HAWK in the deep attack is possible only with very careful and deliberate planning. This same deliberate planning, done in the context of METT-T for the situation at hand, may indicate that HAWK's employment is not practicable.

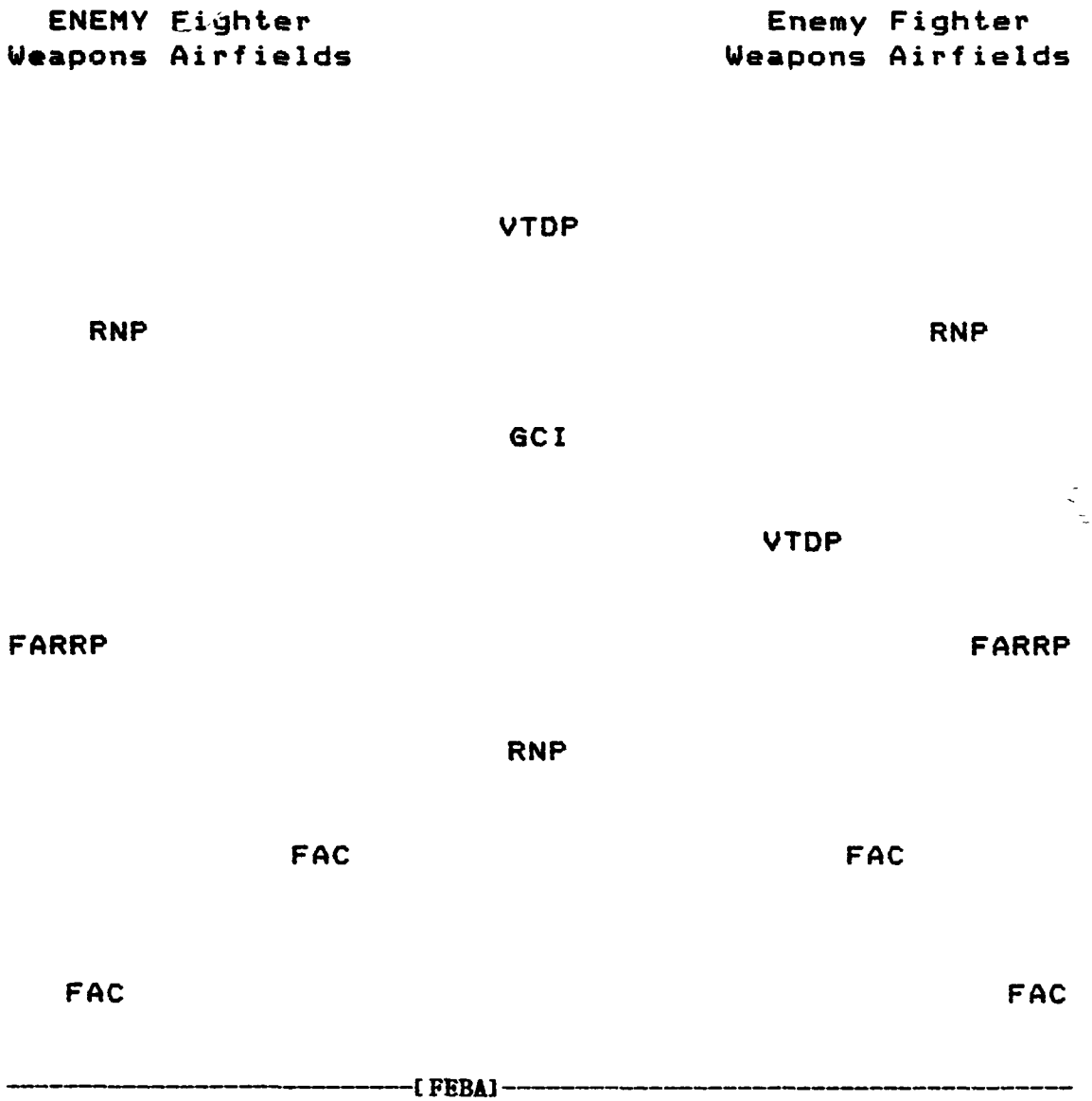
With major changes in doctrine on the order of magnitude of going from the active defense to AirLand battle, there must be appropriate changes to weaponry. The deep attack would best be supported if the emplacement times associated with HAWK were eliminated, total firepower was always available and air defense systems of few (or one) vehicles were employed. Perhaps at some future time a mobile SAM system will be fielded that better fulfills the requirements of deep operations in the AirLand battle. Until then, the corps commander must conduct operations within the constraints imposed by HAWK or accept much higher risk; the risk of operating outside of his medium to high altitude air defense umbrella.

FM 100-5 suggests the importance of the counterair mission to the protection of a maneuver force. The events of recent wars support this notion with historical fact. This paper has avoided attempts to establish modern counterair capabilities as the center of gravity for contemporary military actions. However, a strong case can be made with historical support that the airspace contiguous to a military operation at any level of war constitutes a decisive point. Controlling this decisive point is especially important in the deep attack.

Joint counterair operations, that can be integrated and synchronized with maneuver, will ensure control of the decisive point in the AirLand Battle's third dimension. The air superiority that is gained will enable the commander to retain the necessary initiative and freedom to maneuver to win the deep battle.

APPENDIX

Enemy CAS System



LEGEND:

FAC ---------- Forward Air Controler
FARRP ---------- Forward Area Rearm Refuel Point
GCI ---------- Ground Control Intercept
VTDP ---------- Vector Target Designation Point

(FC 100-15-1, p.B-19)

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